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Are There Cost Differences in the Argentinean Pension Fund Industry? An Efficiency Frontier Analysis

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Abstract: The purpose of this paper is to study the existence of differences in costs between pension fund administrators (PFAs) through the estimation of an econometric cost frontier for Argentina. Like in other eleven Latin American, and some other Central Asian and Eastern Europe countries, the social security has been privatized, and the individual accounts of defined contribution plans are managed by PFAs. The issue is relevant because of its potential regulatory implications. Cost savings (efficiency gains) could be passed-through to contributors, increasing their pension funds (that is, their pensions at retirement). The concept is applied to utilities' regulation in countries where price-caps are applied, and an X-factor is set by the regulator to distribute the efficiency gains, but it is not the practice in privatized social security systems. In Argentina a price-cap has been introduced in pension funds markets since a 2007 reform. Though it allows the regulator to modify that cap, in doing that no provision was established for a technically acceptable methodology. We show that the use of efficiency frontiers could fill the gap, because it provides a technical tool to help in that key resource allocation decision. From the empirical work, it is found that there are important differences in efficiency among PFAs. This gives some clues to the regulator for implementing sector policies.

Key words: Pension funds, Efficiency frontiers.

Jel Codes: G23, C29

I. Introduction

The purpose of this study is to determine the existence of differences in costs between Argentine pension fund administrators (PFAs) by the estimation of an econometric cost frontier. In Argentina, like in other eleven Latin American countries, the social security has been privatized. A defined contribution scheme was set, and the worker's individual accounts are managed by PFAs. The results have a potential regulatory use, since a recent reform in 2007¹ established caps to the commissions of the funds, and gave the possibility of its periodic reset by the regulator, but no provisions were made in order to cope with the problem of how to reset commissions.

The outputs of the PFAs comprise fund management (and account maintenance related activities) and under contracting (at the recent 2007 reform) of disability and death policies for the affiliates to the plans, made in life insurance companies. The reform established a common pool of resources to attend those risks since 2008 financed by a commission on accumulated funds

Like other similar schemes inspired in the Chilean reform of 1981, the system has high commercial costs, since the "competition" in the industry acts by means of shifts of affiliates from one fund to another. The PFAs devote resources to earn shifts from other PFAs. That feature of the system has been severely criticized for analysts of the reforms, notably Barr (2000), and Orszag and Stiglitz (1999).

Pension fund management could be provided at several cost levels. The industry is heavily regulated, as other financial services, and particularly provided it is sensitive because of its social goals (to provide consumption in the old age, and to cover invalidity, orphan and widowed benefits in case of death of the worker). Efficiency gains in a (generic) regulated industry could be passed-through to the consumers in the form of lower prices. Normally, pension fund industries are not subject to price-caps, like electricity or water services are in some countries. But in the particular case of Argentina, a recent reform introduced a cap in PFAs commissions, and determined that the regulator could modify such figure. Unlike in utilities industries, in PFA commissions are set as percentage points of the contribution rate, and they are automatically linked to the wage inflation.

Could be imagined an X factor in this industry to pass-through efficiency gains? If the answer is "yes", is there a method, technically reasonable and politically feasible to implement an automatic device to adjust regulated prices? We think the answer to both questions is "yes". Efficiency frontiers methodology is a possibility, which has both advantages in our point of view. So our motivation is intellectually driven (to assess efficiency levels) but also policy oriented (to suggest a method for resetting commissions' caps).

There is not an exhaustive literature on efficiency frontiers methodology applied to pension funds, but is plenty of evidence in other financial services, like banking or insurance. In the pension fund industries –in particular in the Latin American version of this business, the precedents to this work are Braberman et al (1998), Barrientos and Boussofiane (2005), Ferro and

¹ The Law 26.222 passed in 2007 was a reform which allow affiliates to pension funds to return to the pay-as-you-go public system, change the way invalidity and survivor benefits are financed, and set a cap on the commissions of the PFA.

Romero (2006b), Ferro (2007) and Ferro (2008). Braberman et al (1998) estimate a cost frontier in a more general analysis of the cost drivers and economies of scale of the system, with quarterly data of a couple of years of operation. In Barrientos and Boussofiane (2005), efficiency is analyzed with mathematical programming methods applied to the internationally well-known Chilean system, the older of this type of reform. Ferro and Romero (2006b) develop an efficiency frontier with a yearly frequency panel data for Argentina, to study the effects of the macroeconomic crisis of 2002. Ferro (2007), investigates the costdrivers in a set of Latin American countries which reformed their pensions. Ferro (2008) estimates a cost function for Argentina with the same database, which here we estimated the frontier.

In the following section, a conceptual discussion is made concerning the features of the Argentine pension system and the existent literature on frontier estimations applies to PFAs. The methodological choices are also included. In section three, a discussion is made on PFAs' relative efficiency. The fourth section is devoted to present the database and the results. Finally, the section five concludes.

II. Some features of the industry, model searching and methodological choices

In twelve Latin American countries had been reformed the social security systems to introduce private pension funds, based on contributions to individually held accounts, on fully-funded schemes managed by pension fund administrators (PFA). The first reform was the Chilean in 1981. Argentina was the fourth country, which reformed its public defined-benefits pay-as-you-go system in 1994, after Chile, Peru and Colombia did. Twenty-five PFAs started a completely new market of financial services, and after a number of mergers and acquisitions, eleven remain at the beginning of 2008. They manage up to date around thirty billion dollars, from eleven million people.

The activity PFAs develop consists in managing funds from mandated contributions (voluntary savings are admitted in addition) and in under contracting insurance to cover risks of invalidity and death. In this article we analyze only the first activity. PFAs compete between each other for the stock of existent affiliates and for the flow of new workers. The firms try to affiliate, to retain, and to earn shifts of affiliates from other PFAs, plus the new entrants to the labour market. With each old affiliate, which is incorporated to a PFA, their funds are also shifted. Each active contributor affiliated to a PFA, could shift to another one twice a year.

PFAs spend in commercial and administrative expenses; they have to pay salaries, software, custody services, and a fee for the service of collecting of contributions to the tax authority, publicity and marketing. Fixed assets are relatively of less importance (offices and computers), and in some particular cases, they are shared with other financial institutions. The minimum mandated net worth to be allowed to operate by the regulatory authority is equivalent to one million dollars.

Benefits of the system are paid as annuities or phased withdrawals. With the funds accumulated in the PFA, at the retirement age, the affiliate could contract an annuity from a retirement insurance company, or alternatively could maintained the money in the PFA and retire it at the same path as the annuity. This latter arrangement allows making a bequest with the remaining capital at the death of the affiliate (not possible in the case of the annuity), but at the same time when the money in the account is exhausted, the benefit ceases. The longevity risk remains in the insurance company in the case of the annuity and in hands of the pensioner in the case of the

phased withdrawals scheme. The retirement insurance providers of annuities and the life insurance companies offering coverage for invalidity and death risks in the majority of the cases belonged to the PFAs.

For the Argentine case, which is the focus of this study, Ferro (2003) makes a detailed description and analysis. In Ferro and Romero (2006), a frontier approach is made, with panel data of annual frequency, attending the variability along the periods and those shifts related to regulatory changes and macroeconomic crisis.

The pension fund industry started operations in Argentina on July 1994. Initially, twenty five operators were authorized to collect contributions, but some mergers reduced the number of funds to eleven nowadays. A panel dataset was elaborated with quarterly observations, for the period 1996-2006.

As mentioned above, there is a lack of literature on efficiency frontiers applied to pension funds.

Barrientos and Boussofiane (2005) develop efficiency measures for PFA in Chile using DEA (Data Envelopment Analysis). They identify the PFA performance, address the effects of the regulatory policies and discuss if the market pressure or the regulation explained the high costs of the pension funds. Recently, Pestana-Barros and Medeiros-Garcia (2006) study the case of Portugal.

Braberman et al (1998), in an estimation of costs of the industry develop a frontier efficiency analysis, and analyze how a couple of regulatory reforms affected the costs of the industry, its efficiency and the relative position of the PFA in an efficiency ranking. They find that the lower the commercial costs were, the higher was the efficiency. In Ferro and Romero (2006b), two econometric models are estimated in order to assess efficiency, and the response to regulatory and macroeconomic shocks on the industry. It is found that efficiency levels decline after 1998 up to 2001. From that year the average efficiency stays in lower levels than before 1999. There are not significant differences in ranking when comparing deterministic and stochastic models.

III. PFAs' Relative Efficiency: Methodological Aspects

Technological frontier studies can be classified according to the specification and estimation methodologies.

Regarding specification, the problem can be approached from two different views: the production function and the cost function. The production function shows the output as a function of inputs, while the cost function shows the total cost of production as a function of output and input's prices. One advantage of the cost function over the production function approach is the flexibility to adopt different specifications, particularly in the cases when the firm produces more than one product. Moreover, estimation of production function allows obtaining a measure of technical efficiency, but ignores locative efficiency problems. Estimation of cost frontiers, on the other hand, gives information on cost differentials due to technical and locative inefficiencies².

Related to the estimation technology, both production and cost functions estimates can be obtained using statistical or mathematical programming methods. Non-statistical methods estimate frontiers (which can be parametric or non-parametric) without assumptions on the form

² To separate these two effects it is necessary to formulate some additional assumptions.

of the distribution of the error term. The estimates, as a result, have no statistical properties, making it impossible to test hypothesis. In the case of estimates using mathematical programming, the frontier can or not be specified as a parametric function of inputs. The main advantage of non-parametric methods (also known as Data Envelopment Analysis or DEA for short) is that no a priori functional form is imposed to the data. The main disadvantage is that to estimate the frontier it uses only a subset of the available data (those actually determining the frontier), while the rest of the observations are ignored.

Once a decision is made on which type of frontier -costs or production- is going to be estimated, and which technique -statistical or mathematical programming, is to be used, the following step is to decide on whether a deterministic or stochastic frontier is to be used.

If a deterministic approach is chosen, the difference between a particular firm and the frontier is attributed to inefficiency. It is ignored the possibility that the performance of a firm might be affected not only by its own efficiency, but also by factors beyond its control (such as adverse climate conditions, regulatory shifts or macroeconomic crisis). An additional disadvantage of deterministic estimates is the high sensibility to outliers. A single outlier observation can have strong effects on the results. Moreover, increasing the size of the sample cannot solve the problems associated with the “outlier problem”.

In traditional cost analysis the problem faced by the firm is to minimize total costs subject to delivering a given level of output. The solution to this problem generates an optimal set of inputs, which depend on output level and input prices. In the same way, it is possible to estimate the cost function of the firm, which depends only on output level and input prices.

The resulting cost model specification is given by: $C = f(Y, Z, P_L, P_K)$, where: C : total cost, Y : output, Z : n -dimension vector of other exogenous variables, P_K : price of capital inputs, P_L : price of labour inputs. The most common specification is the Cobb-Douglas function where the inefficiency terms (ε) enters into the model as a multiplicative factor, which turns into additive in the logarithmic form:

$$[1] \quad c = \alpha + \beta_1 p_1 + \beta_k p_k + \gamma_0 y + \sum_i \gamma_i z_i + \varepsilon$$

Where β_i and γ_i are parameters to be estimated and small cases represent logarithms of the variables presented above.

The systemic part of the model determines the minimum achievable cost with a given set of outputs and environmental variables, and it is known as the cost frontier. According to the deterministic approach, the stochastic part of the model is completely included in the (in) efficiency term. Given that actual costs cannot, by definition, be lower than the frontier cost, the error term cannot be negative. Conceptually, the cost function defines a frontier, which envelops the technically feasible costs associated to particular sets of inputs and environmental characteristics.

The firm with the min (ε_i) will be 100% efficient. For this firm ε_i is zero and therefore $\exp(\varepsilon_i)$ equals one. The larger the inefficiency of a particular firm i the term ε_i will be larger and the resulting efficiency measure closer to zero.

In the case of stochastic frontiers, the cost function is similar to the one presented in [1], but now the error term ε is no longer equal to inefficiency, since it is decomposed into two terms. One

component is assumed to have a symmetric distribution, and the other component is assumed to have a strictly non-negative distribution:

$$[2] \quad \varepsilon_i = u_i + v_i,$$

Where $u_i > 0$ and v_i is not restricted.

The v_i term captures the effects of statistical noise and are assumed to be independently and identically distributed with an $N(0, \sigma_v^2)$. The u_i error term represents cost inefficiency and is assumed to be distributed independently of the v_i and the regressors. Several functional forms have been proposed for the inefficiency term (Half-Normal, Truncated Normal, Gamma and Exponential), but the most common distribution used in empirical tests is the Half Normal.

According to formula [1], a Cobb-Douglas logarithmic cost frontier includes as dependent variable total costs, and as independent ones, a variable indicative of the product or service the firm produces and sells, variables representative of input prices and environmental variables which captures the particularities of the market under examination.

In the particular case of PFA cost function, the dependent variable was structured since accounting book data of the commercial plus the administrative costs of the administrators, where monetary values were deflated to values of the last period of analysis, using the CPI. The costs of the under contracting of the collective life insurance to deal with invalidity and death risks were not included³.

The choice of the variable that represents the product (in fact the service) of the industry is a complex task. It can be used a variety of variables, closely correlated each other. For example, affiliates (members of the pension plans, mandated to contribute), is the most direct candidate, since the costs are related to each personal account. The productive process consists in obtaining affiliates, opening and maintaining accounts, deliver periodical reports, clearing shifts of affiliates between PFA and marketing and publicizing the products. The contribution collection is under contracted to the Federal Tax Administration⁴ (AFIP). Alternatively, it can be used contributors (that is, active accounts, since a number of affiliates could not been actively contributing, because of unemployment, transient participation in the informal labour market or contribution evasion –from the worker or from the employer-). An active account yields income to the PFA (the commissions are based on current contribution flows), but all accounts (active or inactive) yield costs, since the maintenance of the accounts and reporting its developments is mandatory. A third option for the product is the fund itself, which grows with the effort of the PFA. To set up and to manage the fund demands commercial and administrative costs and the contracting of personnel with heavy financial skills (but this costs are negligible in the total; this human capital is an almost fixed input and there are strong economies of scale of its contracting).

With respect to the inputs, the industry employs labour and “capital”. The latter are tangible assets (like buildings and computers) and intangible ones (as software, commercial brands and

³ The activity of the PFA could be analyzed as a multiproduct one, providing directly the fund administration services, and under contracting the invalidity and death risks. The latter was made until the end of 2007 by means of a competitive auction with life insurance companies, but in practice, the majority of the times the provider is a satellite company of the PFA. Here we focus in the fund administration business, letting the life insurance one for another study.

⁴ In other countries, the collection is responsibility of the PFA, for example, in Chile.

databases). Administrative labour is relatively fixed, it is not so with the commercial staff, which has an important turnover within the history of the system. Not having detailed information on salaries, an average was considered dividing the wage account on the sales force. For the “capital” input price a non-labour cost index was constructed, dividing non-labour costs on points of sale (“branches”). The unit “branch” is particularly important in this industry, since the duties the regulation mandate on certain commercial and administrative operations, which only can be made there; for example, affiliation or the shift to another fund. The variables constructed as indicative of the input prices follow the common practice in the literature to assess prices in utilities efficiency studies (Saal and Parker, 2005; Saal and Reid, 2004 and Saal et al, 2004).

The environmental variables constructed, include dummies to capture the effects of important regulatory changes at the end of 1997, a huge macroeconomic crisis in 2001⁵, a ratio between regular contributors and total affiliates, a lagged indicator of the shifts between PFA⁶, an indicator of geographic concentration against national sparse coverage, another dummy to indicate fund yields over the average⁷, other dummy differentiates market share over and under certain threshold, and finally, a dummy to recall commissions over and under the average⁸.

IV. Empirical results

Quarterly data for twenty-two PFA for the period September 1996 to December 2006 is obtained from the Superintendence of PFA (SAFJP). The system started in 1994 with twenty-five firms. During this period, there has been a strong merger activity. Currently, eleven PFA continue to operate, including a new entrant. Hence, the panel data is unbalanced.

⁵ In 2002, local currency was devalued up to 75% (January through July, appreciating in part later), local GDP fall 11%, national government default on the public debt and a later “hair cut” on a swap operation affected the pension funds because of its exposure to public debt. Contributions were transiently reduced, affecting the cash flow of the PFA and the unemployment rate went roughly to a quarter of the labor force, hitting on the contribution flows.

⁶ In this market, affiliates are captive contributors, but into the system they could shift between PFAs twice a year under the condition of regularity in their contributions. Recently, it was established the possibility of move once on five years to a public pay-as-you-go defined benefits public system which survives to the reform, initially to retain elder affiliates and as a political transaction to pass the legislation (the reform was –and continues to be– heavily rejected by politicians, a fraction of the media, the unions and a great deal of common citizens). Related with the cost drivers, in this artificial market a mimic of competition was established between providers by means of the possibility of shift the affiliation to another PFA. That option could be exercised twice a year, and the PFAs devote a lot of resources to yield a favorable balance between negative and positive shifts (outside and inside the proper PFA). The process is complex and takes time, since shift could be objected and a final clearing is made to trespass the resources in the funds. Because of the former, past shifts explain current costs, since an initial level of expenses is made to add the newcomers.

⁷ In an efficient market, yields of the funds tend to converge. Here, financial efficiency of the market is not tested (since it is reasonable to suspect it is not so), but is worth noting that the regulation imposes strong constraints to portfolio composition (including a 90% “home biased” assets), and that a minimum return is imposed to the funds (0.7 times the average), which in case of not accomplishment implies penalties to the funds –which have to cover the losses with their own resources–. Then the regulation –and not the financial efficiency of the market– tend to uniform the portfolios. Nevertheless, there are differences into the PFA’s yields.

⁸ Until 2000 it was possible to combine fixed and variable commissions on contribution flows. Some PFAs were specialized on high wages affiliates by means of combining high fixed and low variable fees. Since 2000 it is only possible to charge variable commissions, which are neutral in terms of client composition of the funds.

The variables in use were total costs (administrative plus commercial), affiliates, average wages, a cost-index for non-labour costs and some dummies and ratios specially designed. Table 1 presents the descriptive statistics.

Table 1: Descriptive statistics of the variables used in the estimates.

Variable	Mean	Standard Deviation	Minimum	Maximum
Total Costs (\$ Dec.06)	19.380.040	17.461.867	1.010.710	68.835.329
Affiliates (number)	621.694	599.130	20.473	2.337.401
Wages (\$ Dec.06 per quarter)	12.963	5990	3.154	86.001
Non-labour cost price index (\$ Dec.06)	173.369	174.308	5.492	1.924.434
Contributors / Affiliates	0.42	0.10	0.22	0.76
Positive Shifts (number)	2.887	3.107	0.00	18.586

Source: Own elaboration

The variables (in logs) included were: total costs, in real terms (lrcostot), affiliates (lafilt), average salary paid per “promoter” (sales force), in real terms (lrsala), average non labour cost per point of sale, in real terms (lrpk), ratio between actual contributors and affiliates in each period (ratio) and positive shifts of affiliates to each PFA, lagged one quarter (ltrpot_1). Additionally, some dummy variables were taken into account: dummy for 2002 macroeconomic crisis, being 1 in the crisis quarters (crisist), dummy for regulatory changes of 1997, being 1 since the first quarter of 1998 (regut), dummy to denote the market share of the PFA in each quarter, being 1 when that share is 10% or over (dummyshare), dummy to denote the relative commission charged with respect to the average in each quarter, being 1 the average or higher (dummycoret), dummy to indicate fund yields equal or greater to average in each quarter (annual accumulated), being 1 the average or higher (dummyrenret), dummy being 1 for those with national coverage (dummygeog).

We estimated three models: a basis Model (M1), and two alternative models with environmental variables (M2 and M3). Estimates are in all the cases Cobb-Douglas in logarithms. In the “Basis” M1, not all the variables result significant. The re-estimation of the model with “Old Environmental” M2, yield the same set of significant variables than in the original (annual) estimation (Ferro and Romero, 2006 b). In turn, the “New Environmental” M3, required the elimination of two dummies, which were not significant.

In the M1, $lcostot = f(lafilt, lrsala, lrpk)$. The signs of the coefficients are as expected positive for the three dependent variables. Both, lafilt and lrpk are significant at the 99% level, but lrsala is not significantly different by zero. The formula of M1 was constructed according to the economic theory. But the sector has some specific features, which influence the costs.

A first approach to address those environmental features was employed in Ferro and Romero (2006), with annual data and we recalled here those results, adapting the M2 model to the quarterly database in use. To the former “theoretical” cost drivers, included in M1, we add three new variables, which reflect empirical developments in the market under study. The dummy crisist was thought to capture the effects on the sector of the huge macroeconomic crisis of 2002. The crisis affected the system in various ways: contribution rates were transiently reduced, shifts between PFA were delayed, portfolio suffered the devaluation of the currency and the default on public debt and the pension funds cut jobs and close branches. A second dummy, regut, was used in Ferro (2003) to assess the influence of regulatory changes on costs, reflecting a great reform in 1997 which modified the way the PFA compete each other. The third additional variable was

ltpot_1, introduced in Ferro and Romero (2006) to capture the impact on costs of the periodical clearing of affiliates arising from voluntary shifts from one PFA to another. When this first subset of environmental variables is included in the model, all variables become significant at the 99% level (including lrsala), and the signs of the dependent variables estimate coefficients are as expected. Both dummies have negative sensibilities, reflecting that either the regulatory changes or the crisis reduced costs.

But M2 seems to us very specific to the history of the system. Is it possible to reach a model more robust to the industry characteristics? Moreover, is it possible to develop a model, which can be applied to other countries with similar pension fund market design? We try to construct environmental variables more related with the features of the market throughout the whole period of its functioning. Instead of the dummies to capture specific historic developments, we construct four dummies trying to address the market share position of the PFA, the charges to the affiliates –in relation with the average charge of the industry–, the relative return of each fund related to the industry average, and the geographic coverage of each PFA (national or local). The geographic and the relative return of the funds dummies were not significant and they were drop from the model. In the “New Environmental” (M3) another variable was added: the ratio contributors/affiliates. All the set of new environmental variables seems relevant from a sector point of view of the industry. So, a priori, M3 is a better description of the market. Once estimated M3, the signs of the explanatory dummies indicating market share, relative charges and the ratio are all positive: the bigger the market share and the higher the commissions, the higher are the total costs. And the ratio increases costs too, implying that active contributors demand more expenses from the PFAs than affiliates (figure which includes active and non active contributors).

The signs of the estimated coefficients are reasonable and robust to all the specifications. The absolute magnitudes of the coefficients are robustly enough between specifications. The values of Gamma are 0.899 for M1, 0.881 for M2 and 0.786 for M3, and the estimated standard error are 0.037, 0.420 and 0.059 respectively. These results suggest that the vast majority (around 80%) of the residual variation is due to the inefficiency effect u_i . See table 2 for the results.

Table 2: Cost frontier estimates

Dependant variable:	Basis Model	Old Environmental	New Environmental
Lrcostot	M1	M2	M3
Lafilt	0.276*	0.249*	0.331*
Lrsala	0.041	0.111*	0.097*
lrpk2	0.115*	0.084*	0.094*
Crisist		-0.138*	
Regut		-0.129*	
ltpot_1		0.180*	0.172*
dummyshare			0.460*
dummycoret			0.147*
ratioaportafilt			1.679*
_cons	9.454*	8.575*	6.771*
N	575	563	563
Gamma	0.899	0.881	0.786
(Std. Dev. Gamma)	(0.037)	(0.420)	(0.059)

Source: Own elaboration

One step ahead is the assessment of efficiency ratios and rankings of PFAs by its level. The first places correspond to the little PFA, which started with the system and were merged later. They had a lighter structure than the current operators. With this method we obtain an average measure of all the periods to each PFAs.

The results of the three models (see Table 3) show that it is an increasing average level of the efficiency captured by the model when we pass from M1 through M3. Standard deviation of the efficiency levels is lower in M3 than in M2, and also in M2 than in M1.

The positions in the table are robust, since the correlation between the places in M1 and M2 rankings is 0.99, between M1 and M3 reaches 0.95 and between M2 and M3 is 0.96.

Table 3: Efficiency levels and rankings

PFA	Efficiency			Rankings		
	M1	M2	M3	M1	M2	M3
PFA_1	0.902	0.922	0.923	4	4	2
PFA_2	0.143	0.217	0.243	17	17	21
PFA_3	0.933	0.944	0.913	2	2	3
PFA_4	0.707	0.767	0.766	7	8	8
PFA_5	0.086	0.143	0.292	22	22	20
PFA_6	0.704	0.775	0.799	8	7	6
PFA_7	0.502	0.547	0.492	11	11	13
PFA_8	0.460	0.427	0.425	12	14	14
PFA_9	0.440	0.497	0.528	13	12	11
PFA10	0.271	0.342	0.350	16	16	16
PFA11	0.831	0.827	0.780	6	6	7
PFA12	0.960	0.965	0.961	1	1	1
PFA13	0.102	0.163	0.326	20	20	17
PFA14	0.577	0.650	0.705	10	10	9
PFA15	0.143	0.212	0.228	18	18	22
PFA16	0.099	0.157	0.303	21	21	19
PFA17	0.874	0.901	0.890	5	5	5
PFA18	0.367	0.457	0.514	14	13	12
PFA19	0.310	0.399	0.396	15	15	15
PFA20	0.105	0.170	0.309	19	19	18
PFA21	0.626	0.701	0.697	9	9	10
PFA22	0.914	0.937	0.901	3	3	4
Average	0.503	0.551	0.579	Spearman coefficient between rankings M1-M2 = 0.9954 M1-M3 = 0.9548 M2-M3 = 0.9627		
Standard Deviation	0.316	0.299	0.257			

Source: Own elaboration

A simple analysis (Bauer et al, 1998) shows that, as expected in an intra-methodology case, results are consistent. Average efficiencies are similar among the three models, and especially

between M2 and M3. With respect to rankings, they are highly correlated (at a level of significance of 1%).

It is important to remark that, as usual, the consistency is broken when considering alternative estimation methods. We performed DEA estimations using CRS and VRS models. We use affiliates as output and total costs as input and we included the ratio between contributor and affiliates as a neutral environmental variable. The results between econometrics and DEA are significantly different. The average DEA efficiencies are below the obtained through the stochastic frontier (average DEA efficiencies of 0.34 and 0.39 for CRS and VRS models, respectively). Regarding the rankings, they are all not significant (at 10% level) when comparing between methodologies.

V. Concluding remarks

The present study uses a stochastic cost frontier approach to investigate the efficiency of Argentinean pension fund administrators during the period 1996 to 2006. The current paper extends existing empirical work in this area in the following ways. First, it incorporates the regulatory discussion, common to public services, to the social security sector emphasizing the importance of implementing methods of benchmarking among the pension fund administrators in order to limit the asymmetry of information. Second, we obtain econometric estimations of efficiency levels, using a previous search for a model that best represents this industry cost drivers. This last procedure is really important because, unlike public services, there is no a generally accepted model in the existent literature applied to pension funds. The results gives some clues for the regulatory activity in a context of commission caps.

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